



C/C MATERIALS AND PRODUCTS

Specialty C/C
Composites for
High-Temperature
Furnaces and
Heat-Treatment

Advanced Carbon Composites and Products - Made by GraphiMaterials

- Next generation C/C Composites and products
- Exceptional material and manufacturing knowledge
- Leading economical solutions providing reduced customers overheads
- Delivering consistent high-quality services and support
- Broad-Based market solutions

Your Next Generation Material Partner.

Next generation C/C Composites give our customers the competitive edge

GraphiMaterials experience and technological innovation in Carbon/Carbon Composites, allows us to provide our customers with a broad range of solutions - no matter how challenging.

We pride ourselves on not just providing innovative and new C/C technology but also the way we interact with our customers. Our priority is to supply solutions to our customers that help them excel in their field. We can do this because of our diverse thinking and unique C/C materials and technology that can adapt to any given situation.

We have a long history in the development and manufacturing of Carbon/Carbon composite. Our innovative thinking is clearly high-lighted in our advanced short-fibre C/C composite and the technology behind it.

+ Advanced C/C Composites

Features of GraphiMaterials Carbon/Carbon Composites.

'Carbon fibre reinforced carbon composites', or commonly referred to as Carbon/Carbon Composites, CFC and C/C Composite. This advanced material is made of thin carbon fibres and reinforced by a carbon matrix binder creating a composite of highly durable materials.

GraphiMaterials C/C has unique properties that help it excel against conventional long-fibre C/C. These include high strength, lightweight, high-density, high inter-laminar strength and exceptional machining qualities. All of these attributes make our C/C ideally suited for a vast array of industries. For example; industrial vacuum and inert gas furnaces, electronic production, energy and renewable, automotive and aerospace.

■ High Mechanical and Inter-laminar Strength

GraphiMaterials short-fibre offers exceptionally high inter-laminar strength when compared to traditional forms of C/C and graphite. High inter-laminar strength increases overall strength and greatly reduces the chances of fractures and de-lamination.

■ Superior heat-resistance

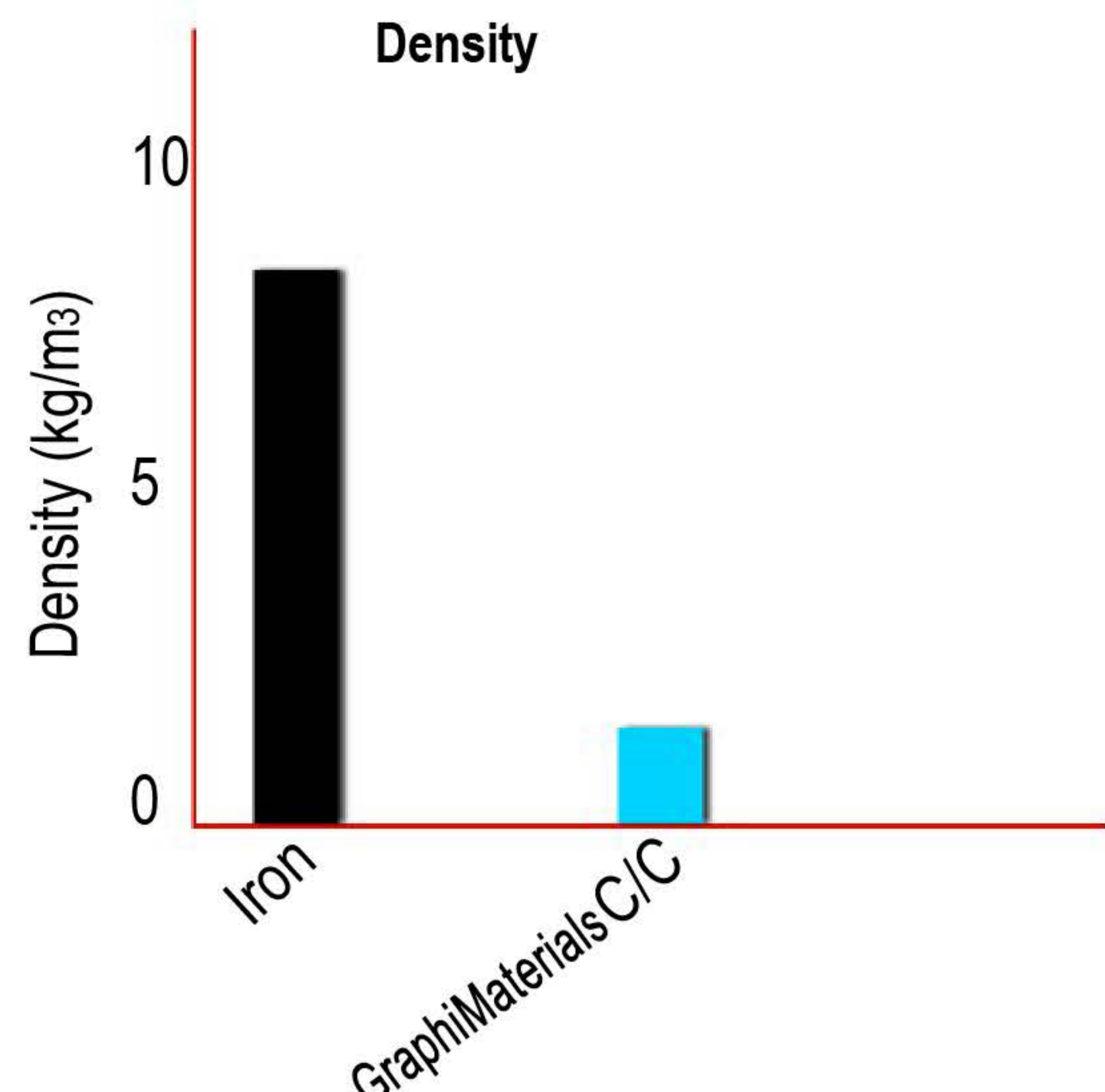
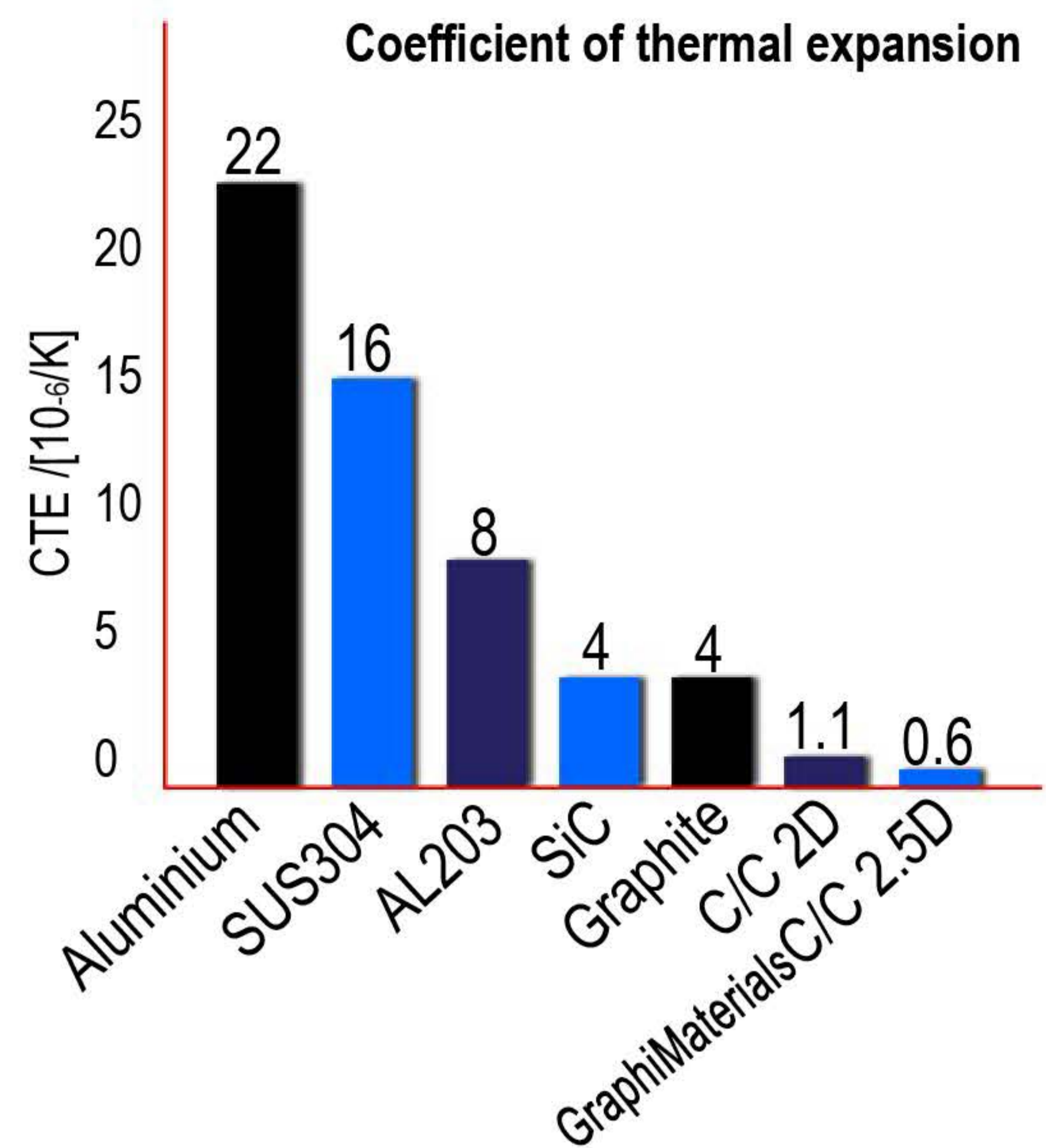
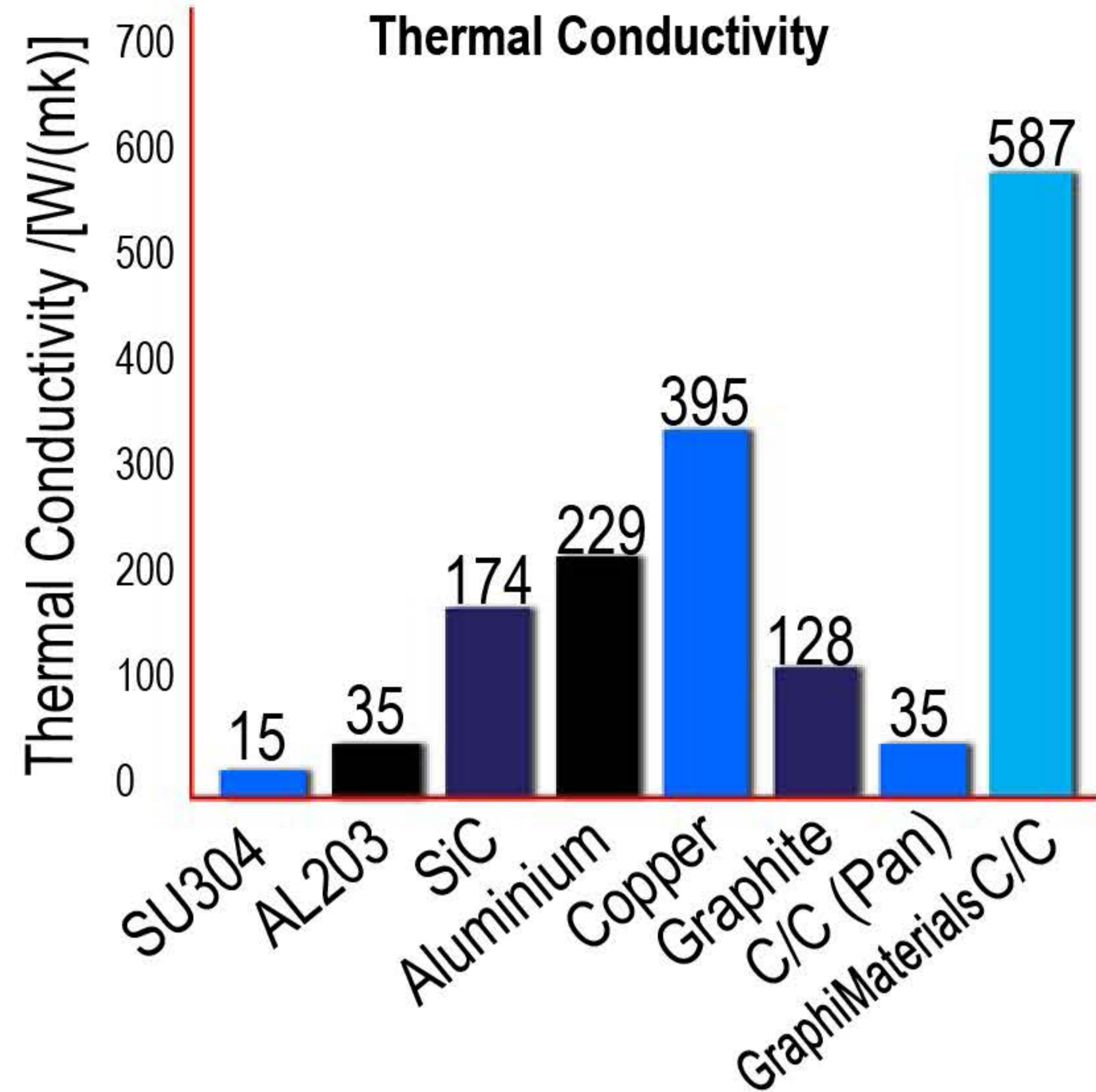
When compared to other typical high-temperature materials and graphite. GraphiMaterials composites in the same environment can exhibit far greater strength over prolonged periods of time. Our Carbon/Carbon Composites can handle temperatures up to 2500c in inert gas and vacuum furnaces.

■ Light-weight and low density

C/C exhibits exceptional low weight and low density. Making it easy to handle when loading and unloading furnaces. C/C provides gives lighter fixtures and structures compared to metal. While it also helps to increase productivity and lower production costs.

■ High thermal conductivity

GraphiMaterials C/C offers high thermal conductivity. The high thermal conductivity allows for greater energy savings.



GraphiMaterials short fibre C/C Composite
- PC70 material

'PM' Method

GraphiMaterials has a long history in the development and evolution of C/C Composites, our cutting-edge manufacturing techniques called 'PM' sets us apart from the rest.

Our core C/C Composite utilises a 'chopped' carbon fibre rather than traditional long-fibre carbon. This type of C/C Composite is also referred to as random weave or short fibre.

We are pioneers in the development of short-fibre C/C and dedicate ourselves to this composite due to the advantages over commonly used long-fibre. This includes greater mechanical strength, exceptionally high Inter-laminar strength and higher than average density.

Our advanced C/C Composites and 'PM' manufacturing procedure make us dynamic which allows us to quickly adopt to customer and market needs.

- Quicker production times reduce customer's downtimes.
- Lower pre-production costs, lower C/C cost.
- Highly specialist production, providing higher quality C/C
- High strength C/C that is easy to handle and machine
- Bespoke designs and capabilities
- Lengthy experience of C/C Development

+ 'PM' Production Technology

State of the art manufacturing procedures and standards designed by

Our state-of-the-art manufacturing process called 'PM Method' has just 5 steps and removes several procedures that are found in traditional processes, this helps reduce production time but still delivers market leading high quality C/C Composites.

The key to our 'PM' Method is our highly developed impregnation technology and heating cycles. The highly developed process, not only increases the C/C quality and strength, but we are also able to lower pre-production cost and produce materials quicker than average competitor lead times.

The 'PM' methods allows us to help further support our customer by passing on saving, thus greatly reducing their overheads .

PM Production → Lamination → Molding and Impregnation → Graphitization → C/C Composite

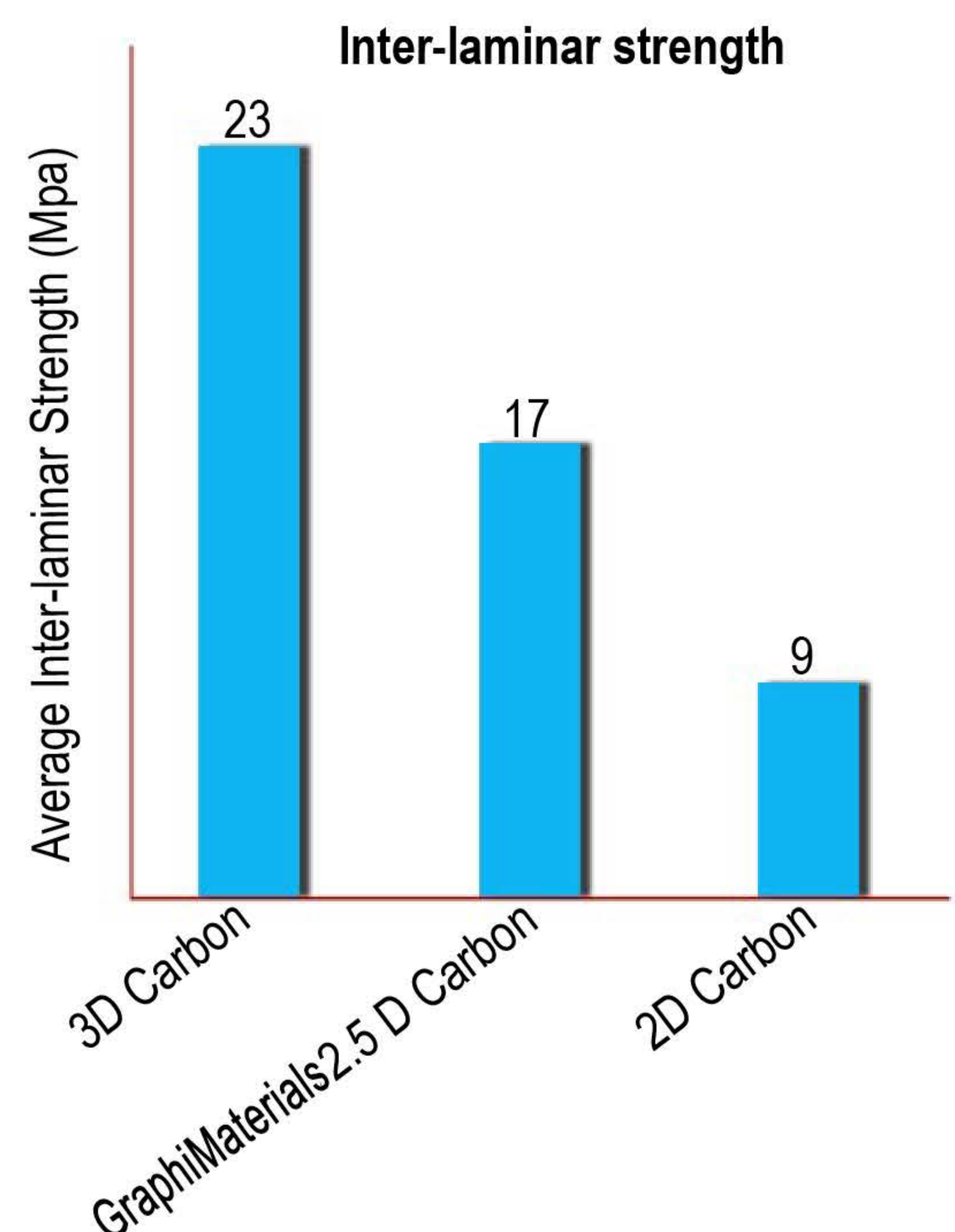
Understanding the importance of Inter-Laminar Sheer Strength

The key to all C/C composites strength is the inter-laminar sheer strength or ILS for short.

ILS is the strength of the bond between each layer of carbon. The lower the inter-laminar sheer strength is, the greater risk of de-lamination, this is the point where each layer of C/C effectively sheers apart. And that is the primary reason of C/C failure.

There are two types of long-fibre C/C, 3D and 2D. The most commonly used 2D C/C typical has a low ILS, while specialist 3D C/C has a very high ILS but at a high costs.

GraphiMaterials C/C sits between the two types, a 2.5D composite. It has a high ILS while retaining a low cost that is the equivalent to 2D.



+ Premium Carbon Series

High strength, defined quality, efficient.

GraphiMaterials understands the needs of our customers and the industries we supply. We know how important it is to offer several types of technical C/C composites to cover a broad spectrum of industries and applications.

We also know how our customer's specifications and needs can quickly change and this is why we offer several different types of C/C to cater for our customers .

Our composites cover a broad range of applications and utilising our PM technology we can develop a bespoke PC/WL Composite that is tailored to customers specific requirements.

- Specific technical properties can be changed to suit the customers requirements. For example higher density
- PC Exhibits exceptional strength and quality
- Broad range of applications covered

■ Technical Properties

Material		PC70	PC40	PC30	WL60
Bulk Density	g/cm ³	1.7	1.7	1.7	1.6
Flexural Strength	MPa	200	150	200	150
Compressive Strength	MPa	210	190	200	120
Interlaminar Shear Strength	MPa	17	15	15	11
(RT-1300C)		1.3	0.3	1.1	1.1
Coefficient of Thermal Expansion	⊥ 10 ⁻⁶ /°C	10	10.6	10.5	9
Thermal Conductivity		35	75	130	33
	⊥	12	20	29	10
Specific Heat	20C J/Kg · K	720	740	720	
Electrical Resistivity	μΩcm	2000	1300	1000	2800
Charpy Impact Strength	KJ/m ²	20			
Shore Hardness		75			
Temperature rating	°C	2000	2500	2500	2000

■ Available sizes

Grade	Thickness (mm)	Length and width (mm)	Grade	Thread	Length (mm)
PC70	1T - 50T (1mm increments)	2000x1000 - 1120x1120	PC70	M6 - M30	1000 - 1500
PC40	3T - 30T (1mm increments)	1000x1500 - 1000x2000			
PC30	30T - 50T	500x1000	Grade	Rod	Length (mm)
WL60	2T - 5T	1000x1000	PC70	Φ6 - Φ30	1000 - 1500

■ PC and WL C/C Products

Components	Products	PC70	PC40	PC30	WL60
Furnace construction components	Structural panels	•	•		•
	Screws, nuts	•	•	•	
	Threaded bar. Rods	•	•		
	Fans	•	•	•	
	Grids, trays	•	•		
	Beams, base trays	•	•		
	Rollers	•	•	•	
Insulation protection	Muffles, susceptors	•	•		
	Heat shields, Liners	•			•
	Tubes, cylinders				•
Heating systems	Heating elements, connectors			•	

+ Core Industries

Carbon/Carbon Composites supporting today's modern industries.

Carbon/Carbon composites are becoming an integral part of many modern industries. We are seeing an increasing demand and adoption by savvy industries that understand the importance of Carbon/Carbon to help aid production output and reduce costs. Our continued efforts to push the technological boundaries of our materials allows us to offer multi-functional C/C products that are suited for variety of customers and specialist fields.

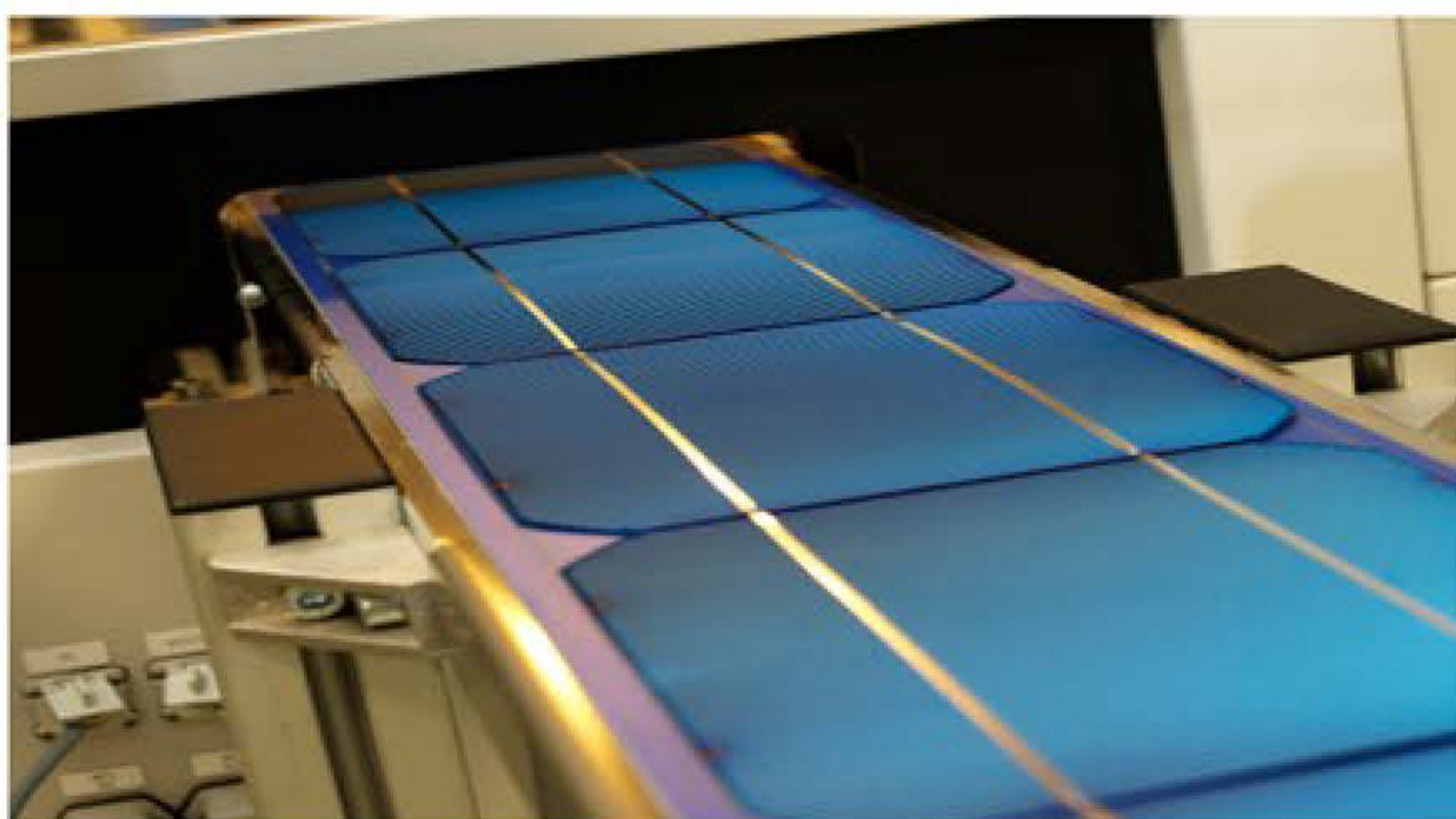
You will find our C/C Composite products in many modern industries, from Photovoltaic manufacturers to high-temperature furnaces for heat-treatment as well as aerospace and automotive friction applications.

High-Temperature Technology

Industries that work in High-Temperature and Heat-Treatment require minimum downtime and maximum output.

You can rely on GraphiMaterials to supply C/C components for the field of high temperature applications, whether it be in the glass industry or furnace construction.

- Furnace construction
- Glass industry
- Commercial Heat-treatment, brazing, sintering
- Tool and Die
- Automotive
- Aerospace



Energy Technology

Clean energy sources are a key focus in today's modern world and providing clean energy that is affordable and accessible is of high importance.

At GraphiMaterials we are driven to helping to reduce costs and increase performance for a wide range of energy industries.

- Solar Cell production
- Silicon crystalline growing
- PECVD
- Nuclear industry



Friction Technology

We have a long history in producing Carbon/Carbon friction technology and supply many types of transportation technology. This includes Formula 1 clutches, Rail Pantographs to aviation braking systems. Our Carbon/Carbon exhibits excellent longevity to significant weight savings thus reducing energy consumption.

- Aviation braking
- Automotive braking and clutch
- Rail
- Industrial braking



Specialist Technology

There are industries that require high-temperature materials that are very specific to their needs. We offer unique services from fully customised Carbon/Carbon composites to thermal coatings.

- Robotics
- Oil and Gas
- Magnetic production
- Medical

+ Carbon/Carbon Products

Manufacturing a range of products for a broad range of industry.

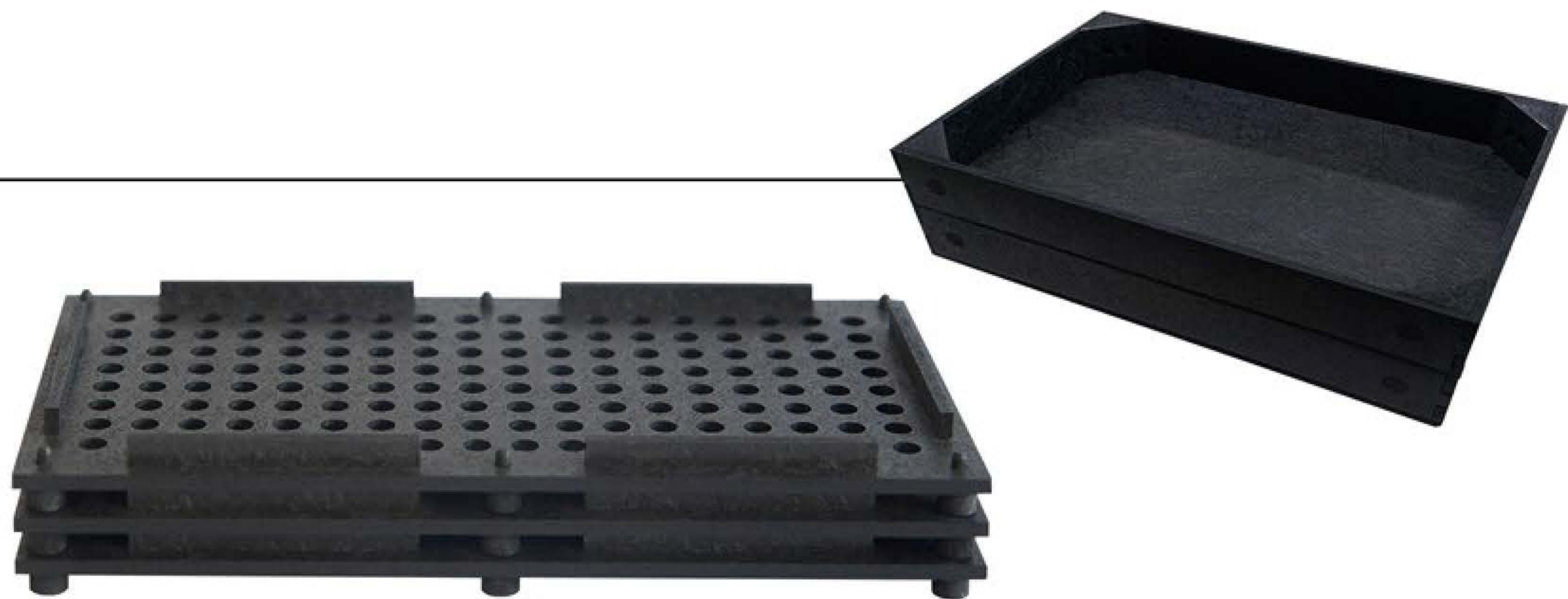
■ C/C Fasteners

- C/C Threaded bar
- C/C Plain rod
- C/C Screws
- C/C Nuts and bolts
- C/C Washers



■ C/C Fixtures

- C/C Multi tier Grids
- C/C Trays
- C/C Shelves
- C/C Baskets



■ C/C Plates and sheets

- C/C Plates
- C/C Sheets starting from 1mm
- C/C Blocks



■ C/C Friction

- C/C Clutch discs
- C/C Brake rotors



■ C/C Miscellaneous

- C/C PECVD Carrier
- C/C Rollers
- C/C Boats
- C/C Robotic arms
- C/C Glassware, take out tongs, dead-plates, sweep arms.





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